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November 17, 1998

**EX PARTE**

Magalie Roman Salas, Secretary  
Federal Communications Commission  
Washington, D.C. 20554

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**NOV 17 1998**

Re: ET Docket No. 98-42  
RF Lighting Devices

FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY

Dear Ms. Salas:

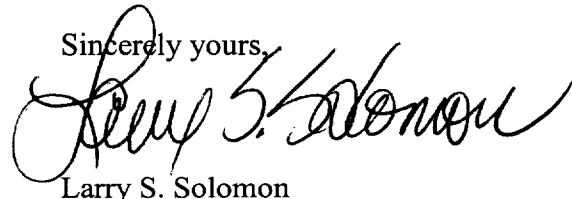
On November 9, 1998, Dr. Michael W. Ritter, Senior Director of Systems Engineering for Metricom, Inc., and Henry Rivera and I from this office, met with Julius Knapp, John Reed and Anthony Serifini of the Office of Engineering and Technology to discuss Metricom's position in this proceeding.

The discussion closely followed Metricom's Comments and Reply Comments filed in the proceeding. In addition, there was a discussion about the interference potential of 2.4 GHz RF lighting devices to Part 15 2.4 GHz outdoor devices, and copies of the attached presentation and "Microwave Interference" paper were used during the discussion.

In accordance with Section 1.1206 of the Commission's rules, two copies of this letter and associated attachments are being submitted.

Please contact the undersigned if there are any questions in connection with this matter.

Sincerely yours,



Larry S. Solomon

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FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY

Metricom, Inc.

Dr. Michael W. Ritter  
Sr. Director of Systems Engineering

9 November 1998

9-Nov-98

MWR

# Metricom Overview

- Public company (MCOM), founded in 1985
- 300 employees and consultants
  - Headquartered in Silicon Valley
  - Networks in SF Bay Area, Seattle, Washington DC, parts of LA, numerous airports, campuses, and small towns
- Tens of thousands of radios operating across the US
- Over 27,000 customers
- Uses unlicensed, shared spectrum
- Part 15 Coalition member

# Typical Customers

- Education, K-12 and Universities
  - Stanford, Berkeley, George Washington, etc.
- Corporations
  - HP, Sun, IBM, Cisco, etc.
- Industrial
  - Southern California Edison, etc.
- Franchisees and Partners
  - K & N Energy and PEPCO
- Governments
  - LAPD trial with IBM, other police departments
  - numerous city governments

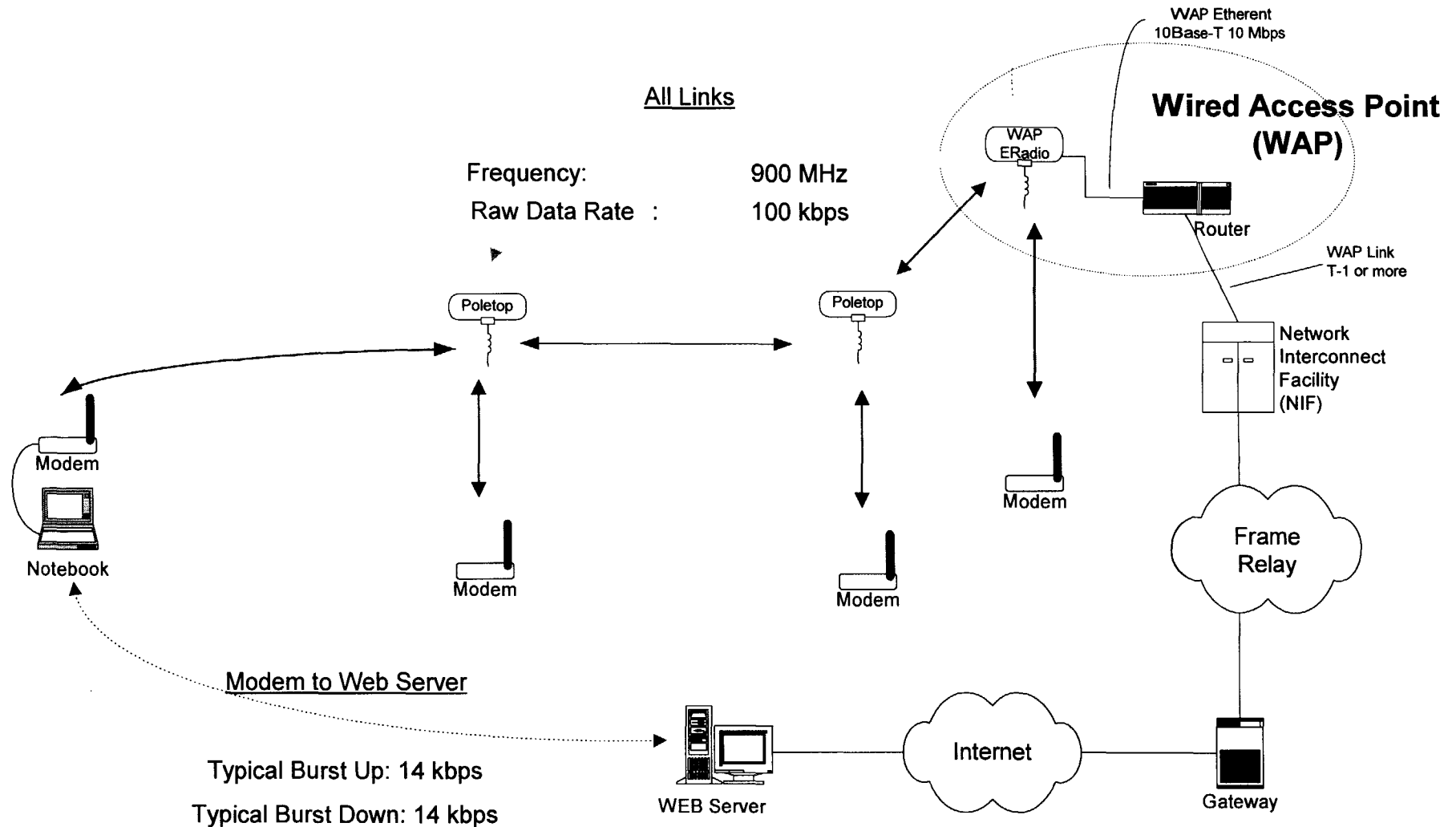
# What Metricom's Customers Expect

- Affordable cost
- High speed
- Broad coverage
- Long-term availability

# Metricom's Current Network

- 100% digital packet-switched network
- Intelligent Microcells on streetlights and buildings
- Frequency hopping, spread spectrum
- Proprietary architecture
- 20 patents
- Uses 902-928 MHz band

# Ricochet Network Overview



9-Nov-98

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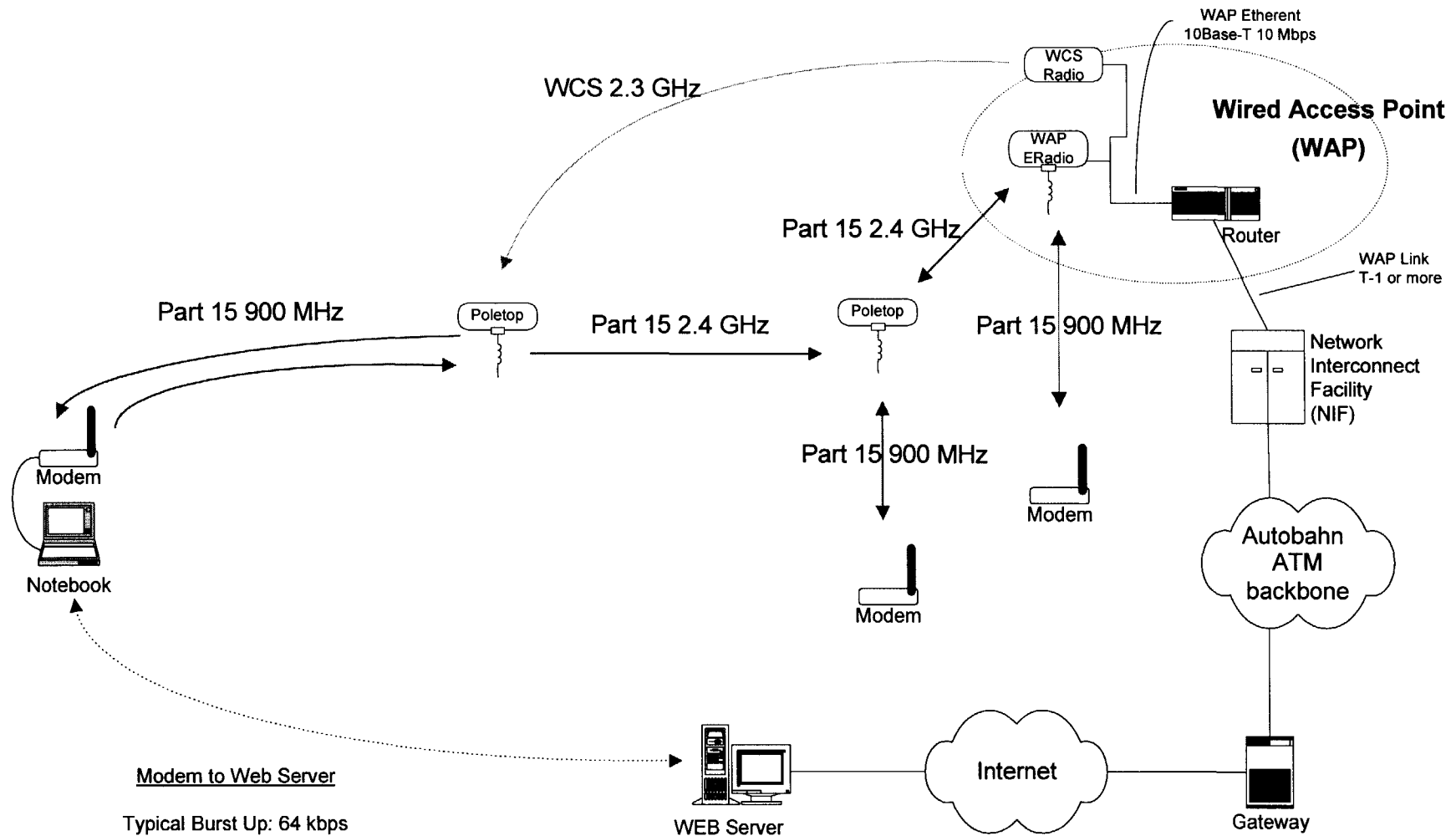
RJFMWR 9/29/97

# To Be Deployed Next Year

- Autobahn Network
- Productive use of multiple frequency bands
- ISDN (128 kbps) throughput rate
  - Advanced modulation schemes
  - More efficient use of spectrum
- More sophisticated protocols
- “Soft” radios



# Autobahn Network Overview



9-Nov-98

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RJM/MWR 9/29/97

# The Problem

- As proposed, RF lighting will make the 2.4 GHz band unusable for Metricom and other Part 15 providers
  - wherever they are we can't be
- Metricom's comments demonstrate Fusion's RF lighting generates significant band pollution
  - not their desired product (which is light, not RF)
- Preliminary Metricom lab tests illustrate this problem

# Conclusion

- We all agree that the FCC-encouraged Part 15 is a great idea
  - significant innovation has occurred
  - a new industry has come into being
  - unlimited entrepreneurial opportunities
- The Commission must require in-band limits for 2.4 GHz RF lighting
  - Failure to do so will lead to the demise of Part 15 operations in the band
- We want to share the band with all users
  - Simple rules would make this possible



# Microwave Interference

Bob Friday May 06, 1998

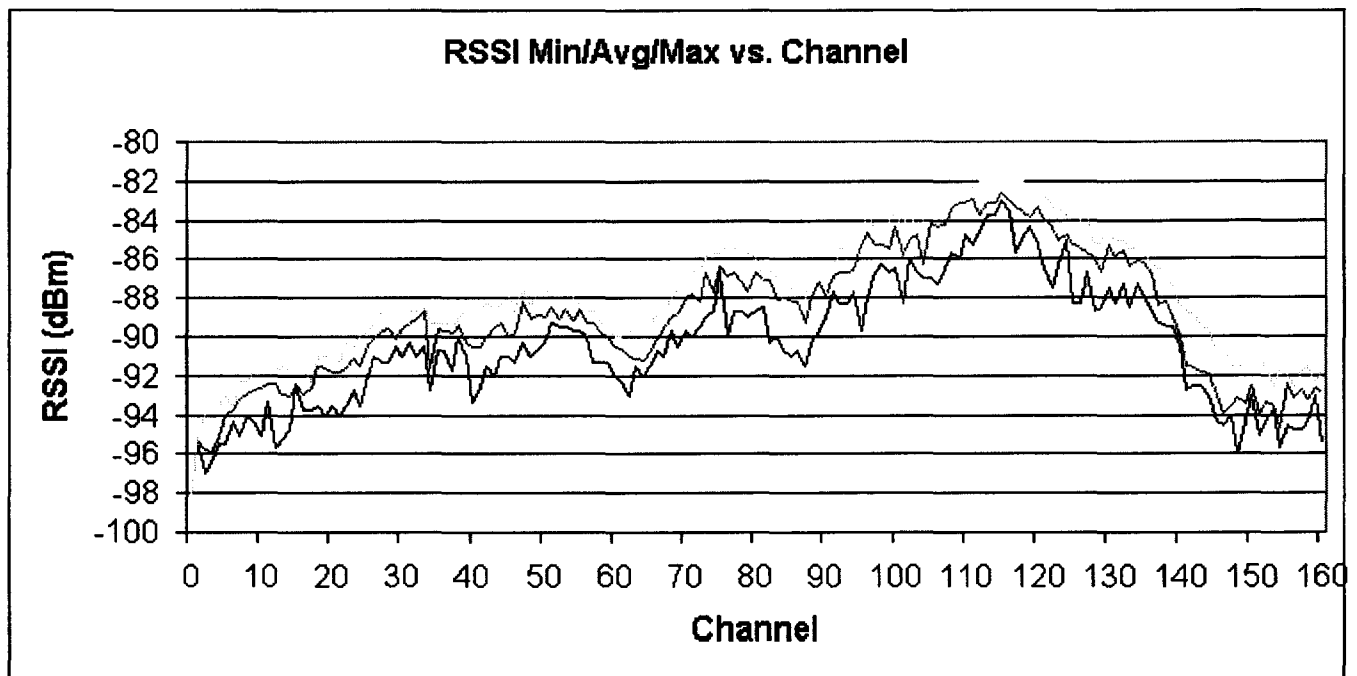
## Abstract

This paper examines the effect of microwave interference on Metricom's 2.4 GHz link. We present the time spectrum of the RF signal and the bit error rate and patterns produced by microwave ovens, which will be similar to RF microwave lighting if it follows the same health and safety rules. Finally, we present the interference or packet error rate as a function of packet size these interferers will produce.

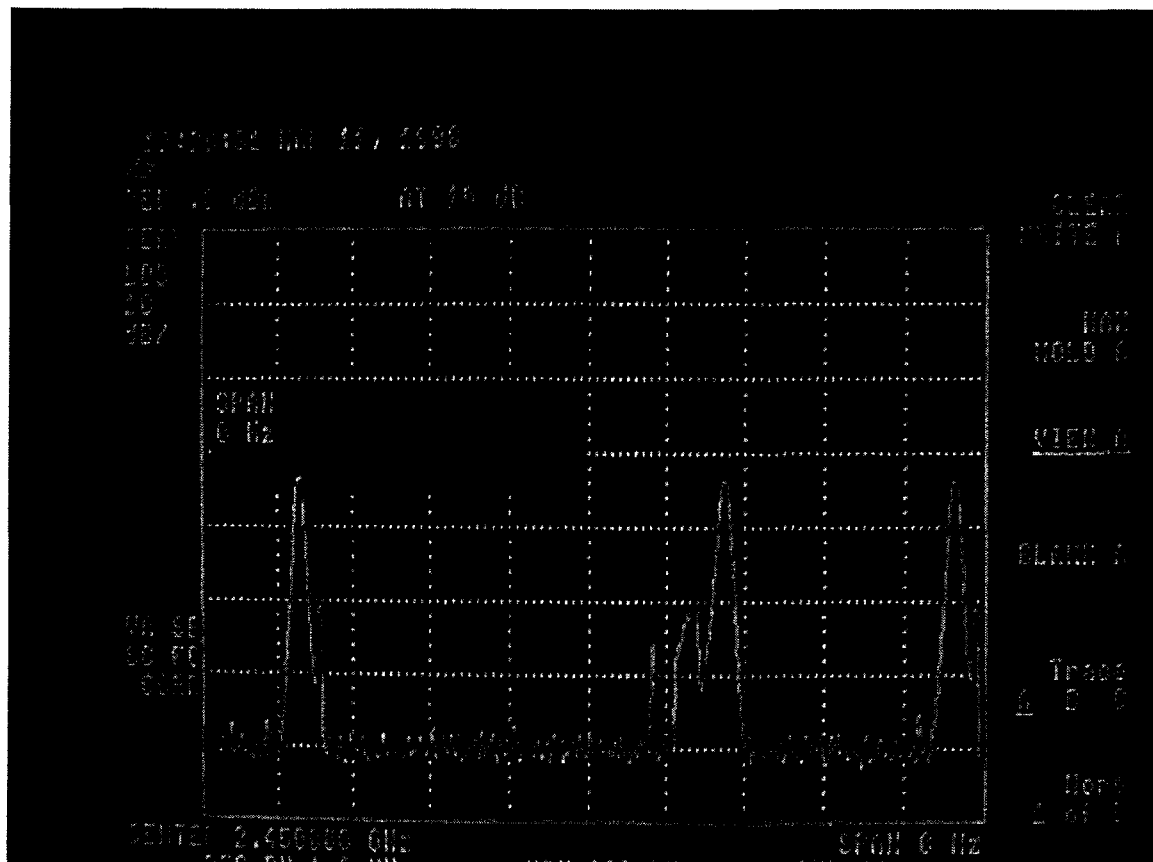


Picture of Test Setup

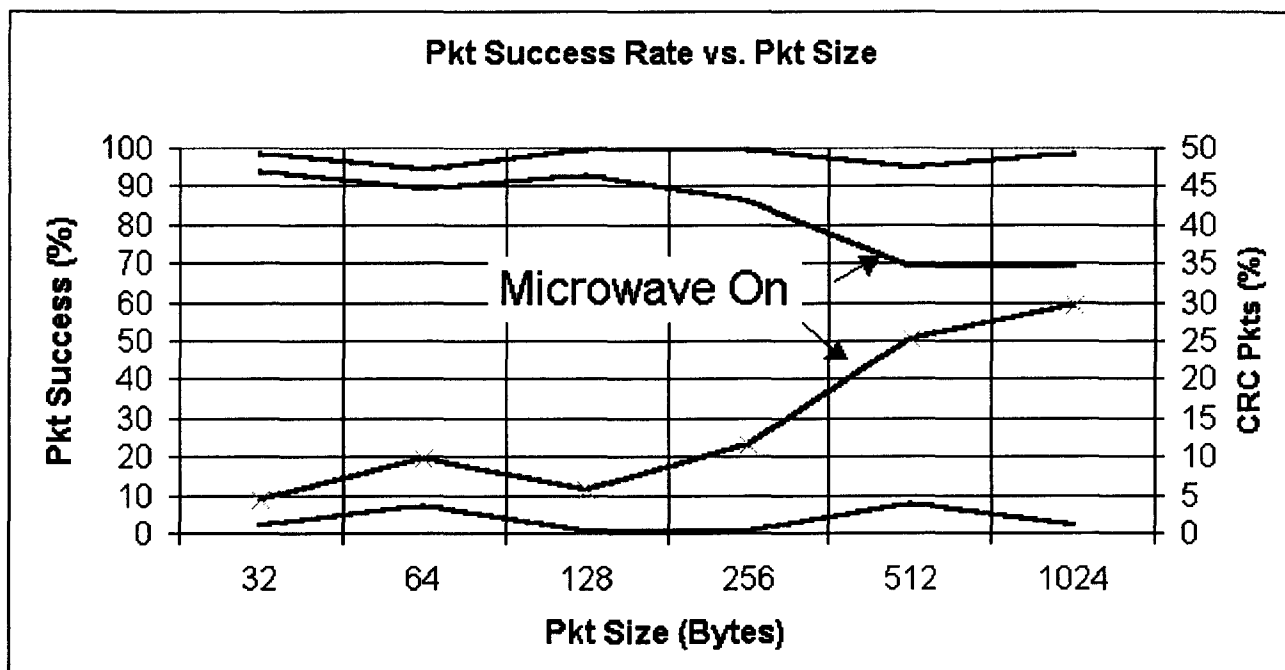
The test setup consisted of an ERadio in my office sending packets of various sizes to a radio on my desk with attenuators on the antenna input to get the link to be operating approximately -85dbm. The microwave was placed in my office to and contained a large cup of water when running. The graph below shows the receivers view of the link.



The picture below shows the spectrum analyzer display of a Microwave oven (700W Kenmore) heating water. The analyzer is set to zero span and shows the time characteristics of the Microwave oven's interference. The x axis is at 2 msec per division. The oven is cycling at 60 Hz (every 16 msec it starts a new cycle). Based on measurements done in our lab, this Microwave oven was approximately equivalent to a 500 mW isotropic radiator while heating water and a 0.1 mW isotropic radiator while empty.

**Comments:**

- **The Microwave oven increases the packet error rate by 5% at a minimum**
- **Packets larger than 128 bytes are starting to be affected**
- **Most of the bad packets are received as CRC errors**

**Comments:**

- The Microwave oven causes significant harmful interference when it is pulsing and causes a significant excess in burst errors of over 100 bits in length. At other times the Microwave oven looks like an additional thermal noise source.

